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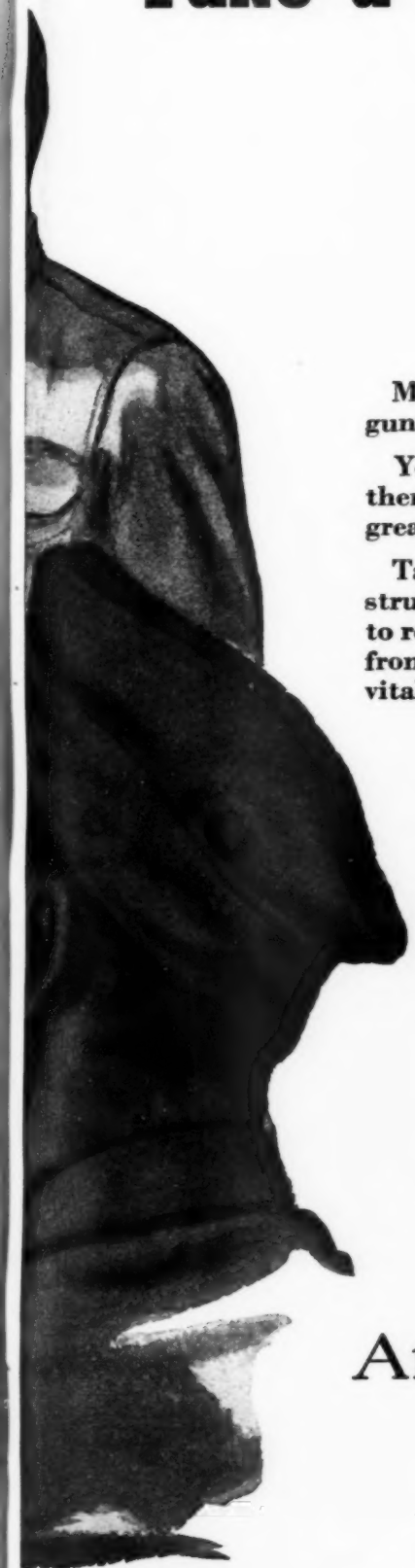

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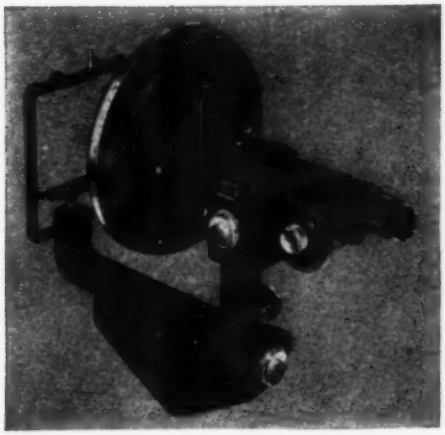

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Vol. 19 MARCH, 1942 No. 3

# THE INFLUENCE OF ORTHOPTIC TRAINING ON READING ABILITY*

## PART I. INTRODUCTION AND REVIEW OF LITERATURE

Henry B. Peters, M.A., Opt.D.
Chico, California

With the ever-increasing knowledge of the multitude of complicated factors that enter into the functional process of reading, new frontiers are always presenting themselves. Workers on all fronts are pushing back the curtain to give us a more complete knowledge of the workings of the human organism in this endeavor. The various lines of attack soon become separated from one another as each group perfects and refines techniques to investigate a small arc in the ever-increasing circumference that separates what is known from what is unknown. Continued research and investigation on the part of many hundreds of teachers and scientists have already contributed a vast body of information. As great a literature exists on this subject as upon any other subject taught in the schools, and this is constantly being augmented by new material and investigation. But the job of analyzing the factors contributing to the successful development of adequate reading skills and ways and means of correcting disabilities is by no means complete. There yet remain many problems to be solved.

In any advancing field of investigation and interest, especially one that is advancing so rapidly, there are bound to be gaps that need to be filled. As the leaders push forward in their own special lines of interest, they often leave whole sectors that must be examined before the completed picture may be obtained. It is into one of these gaps that this investigation is directed. No claim is made for completeness, but it

*Research done at the University of Nebraska, under the direction of Dr. D. A. Worchester, Department of Educational Psychology and Measurements, with a research fellowship from the American Research Council of Optometry, and equipment loaned from the American Optical Company. Submitted on December 6, 1941, for publication in the March, 1942, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY. Part II, "The Problem, Study, Conclusions and Appendix" (with tables), will appear in the April, 1942, issue.

is hoped that this study will direct attention to a part of the problem that has hitherto been neglected. The part to be considered will be the influence of visual training on reading, not training of eye-movement habits, but the establishment of an efficient visual mechanism to perform the acts required in reading.

*Methods of Investigation*

The investigation of the eyes and vision in the act of reading has progressed along two different routes. Two attacks have been made to discover the role that the organs of sight play in this complicated process. One of the paths along which past research has gone may be called THE MEASUREMENT METHOD. It consists chiefly of collecting a vast array of data on the various anatomical and physiological aspects of vision and then making correlations between errors found and reading ability as measured by a series of reading tests. Some have tried to relate visual measurements to scholarship, health, and many other factors. Some writers tend to minimize small deviations, while others emphasize those same factors as most important; but visual errors, especially gross ones, have always been regarded as factors of importance. These gross errors are included in almost every list of predisposing factors of reading disability now published. Visual abnormalities and deficiencies of a more-refined type have been a battleground of comment and implication, but no study has yet made clear the relationships. The line of separation between that degree of error which allows normal development and that which predisposes reading disability has never been set with anything approaching certainty, even though certain authors have committed themselves.

The second line of investigation has been through the medium of eye-movement training; that is, since it is always training in specific reading habits, we may call it THE HABITS TRAINING METHOD. This method includes all the ingenious devices, both mechanical and paper-and-pencil techniques for the training of "correct" eye movements. Developing a greater span of recognition, decreased perception time, reduced number of regressions, more rhythmic movements, accurate fixations, etc., have played an important role in certain teaching techniques and clinical practices. Here again, we are confronted with a highly controversial problem. Investigators disagree markedly in their opinions of the efficacy of training the eye movements in "proper" habits. One group of writers insists that such training improves the efficiency of the motor

habits of the visual apparatus which, in turn, increases the reading efficiency. This group lays great stress on the importance of oculomotor habits and their influence on the reading process. These peripheral habits are said to impose restrictions on the central processes. Another group reverses the argument and claims that these motor habits are simple manifestations of cerebral functions. The neural processes of perception, interpretation, and comprehension determine the movements of the eyes. The eyes reflect, not control, the cerebral functions. So this group places the emphasis on the central processes.

We shall examine further these opposing positions on the two different methods of understanding the relation of vision to reading by consulting the literature of the field. But first, let us propose a third method of attack so that we may be able to evaluate the literature in respect to it also. This method we call the visual training or THE ORTHOPTIC METHOD. It shall be devoted entirely to the development of an efficient visual mechanism. Its aims shall be the reduction of certain psycho-physiological limitations in the binocular organism of visual sensation and the broadening of certain functions which are connected with the act of reading. Training of this nature, not embodying reading in its procedure, is a new attack; therefore, there is little or no literature bearing directly on it. There is a small amount of literature, however, on orthoptics in clinical practice used for adapting the visual mechanism to corrective lenses or perfecting certain visual functions. Although there is very little experimental evidence, much information can be gained from a careful consideration of these theoretical and clinical observations as well as by implications from the other studies.

*Selections From the Literature Pertaining to Measurements*

Tests of visual perception and sensation and of oculomotor and perceptual habits were prepared on slides by E. A. Betts[1] and administered to 190 first-grade entrants. From this and other studies, he reports that 90 per cent of severe reading disability cases manifest faulty binocular coordination and astigmatism. He also states that for some cases, the correction of certain ocular and visual anomalies by a specialist will result in the improvement of certain reading abilities. He makes the point, also, that binocular visual acuity is higher than monocular and

1. Betts, E. A., "A Physiological Approach to the Analysis of Reading Disability." *Educational Research Bulletin* 13, Sept.-Oct., 1934.

that the right eye acuity is higher than the left. D. E. Swanson and J. Tiffin,[2] employing Betts' physiological approach to the college level, tested 227 students who were divided into three groups: (a) unselected group, (b) good readers, (c) poor readers. They found very little relation between Betts' tests of visual maturity and reading ability. But they caution the reader not to interpret this as a discouragement of visual testing and state that the Betts' tests help in the preliminary diagnosis of visual-handicapped students. In concluding, they say that visual efficiency is probably not related causally to differences in reading ability among college students. P. A. Witty, in collaboration with D. Kopel[3] tested a group of 100 school children who were the lowest of 2,000 pupils on standardized reading tests. The Betts' tests were given along with tests measuring interests, personality adjustment, physical and mental development, and others. The tests were also given to a group of normal readers. The authors conclude from analysis of their data that the poor readers are not characterized by a higher incidence of visual defects and anomalies than are good readers. They point out, however, that before concluding that visual errors have no effect on reading ability, we must examine another alternative, namely, that visual defects may impede the reading process of both "poor" and "good" readers, so correction of these defects may improve the reading ability of "poor" readers and of readers who exhibit no reading difficulties. Other studies by these men[4, 5] led to the same general conclusions and emphasized the point that maximum achievement is related to normal vision. Students should, therefore, be tested for visual deficiencies regardless of the lack of correlation.

T. H. Eames in a series of studies from 1931 to 1938 stresses the importance of visual factors in reading. In an early study[6] in which he examined 64 poor readers and compared them with 87 unselected chil-

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2. Swanson, Donald E., and Tiffin, Joseph. "Betts' Physiological Approach to the Analysis of Reading Disability as Applied to the College Level." *Journal of Educational Research* 29, February, 1936, pp. 433-38.

3. Witty, Paul A. (in collaboration with David Kopel), "Factors Associated with the Etiology of Reading Disability." *Journal of Educational Research*, 29, February, 1936, pp. 449-58.

4. Witty, Paul A., and Kopel, David, "Heterophoria and Reading Disability." *Journal of Educational Psychology*, 27, March, 1936, pp. 228-30.

5. ———, ———. "Studies of Eye-muscle Imbalance and Poor Fusion in Reading Disability." *Journal of Educational Psychology*, 27, December, 1936, pp. 663-67.

6. Eames, Thos. H., "A Comparison of Ocular Characteristics of Unselected and Reading Disability Cases." *Journal of Educational Research*, 25, 1932, pp. 211-15.

dren, he concluded that there was a markedly higher incidence of exophoria in the "poor" reader group; further, that the amplitude of fusional convergence of "poor" readers was only half that displayed by the unselected group. In another study[7] in which comparisons were made between larger groups, similar differences were found which led him to the conclusions that: (a) Percentage of emmetropia is lower in reading disability groups, (b) Greater hypermetropic astigmia occurs in the reading disability groups, (c) Slightly higher percentage of ametropia and exophoria at both distance and near in the reading disability group, (d) Both groups showed higher percentage of the higher refractive errors in the right eye, except hypermetropic astigmatism which is greater in the left eye, (e) The amplitude of fusional convergence, when insufficient, causes fatigue of the external muscles, or neuromuscular mechanism, which leads to reversals, improper fixations, and general reading inefficiency.

In another report Eames[8] studied the effect of correcting the ocular defects of non-readers. He found that the improvement of the corrected group was greater than that of an unselected group and that the differences were statistically significant. Recently (1938) Eames[9] has published another article on the visual characteristics of poor readers. This was a group of 350 selected poor readers. He found that one-third had defective binocular visual acuity, two-thirds had defective acuity for the right eye measured independently and three-fourths for the left eye measured independently. Over one-half exhibited refractive errors of more than one-half diopter. About one-tenth showed a phoria at distance; one-fourth, at the reading distance. He states that in comparison with other groups, these students seem to converge insufficiently. He found also that one-third of the cases were deficient in the ability of fusion and that the relation of adduction to abduction was significantly lower than expected. One-fourth showed restrictions in the central visual field in the horizontal meridian of more than five degrees of arc.

One comparative study that should not be omitted from this dis-

7. Eames, Thos. H., "Eye Defects in Reading Disability." *Eye, Ear, Nose and Throat Monthly*, 10, 1931, pp. 124-25.

8. Eames, Thos. H., "Improvement in Reading Following the Correction of Eye Defects of Non-readers." *American Journal of Ophthalmology*, 17, April, 1934, pp. 324-25.

9. Eames, Thos. H., "Ocular Conditions of 350 Poor Readers." *Journal of Educational Research*, 32, September, 1938, pp. 10-16.

cussion was made by Eames[10] in 1935. One hundred reading disability cases and a control group of one hundred forty-three unselected school children were examined with particular attention to various physical handicaps which were considered causative factors in reading disability. The following are selections from the table summarizing the findings taken from this report:[11]

FREQUENCY OF PHYSICAL HANDICAPS IN READING DISABILITY

| *Physical Handicaps* | *Percentage of Reading Disability Group* | *Percentage of Control Group* | *Differences* |
|---|---|---|---|
| A. Incoordination of the eyes at the reading distance | 69 | 22.3 | 46.7 |
| a. Exophoria | 63 | 16.7 | 46.3 |
| b. Esophoria | 6 | 5.5 | 0.5 |
| c. Hyperphoria | 0 | 0 | 0 |
| B. Hypermetropia | 53 | 27.6 | 25.4 |
| C. Low Fusion | 44 | 18 | 26 |
| D. Astigmatism | 30 | 43.9 | 13.4 |
| a. Hypermetropic astigmia | 27 | 36.2 | 9.2 |
| b. Myopic astigmia | 3 | 7.2 | 4.2 |
| E. Myopia | 3 | 7.2 | 4.2 |

C. A. Selzer[12] in 1933 investigated eye-muscle imbalance, lateral dominance, and fusion by means of a series of stereoscope slides. In his study he examined thirty-three poor readers and one hundred unselected children. Heterophoria was displayed by ninety per cent of the disability group; only nine per cent of the unselected group manifested such a defect. From this investigation, Selzer concludes that:[13]

"Conditions of muscle imbalance and alternating vision, in addition to lack of fusion, . . . account for such reading disability as is not accounted for by general mental disability. The lack of visual fusion is due to muscle imbalance that has existed from birth or early infancy."

L. P. Farris[14] in 1934 conducted an extensive investigation on one thousand six hundred eighty-five seventh-grade pupils of the Oakland public schools. The visual examinations, including tests of acuity, astigmatism, accommodative-convergence, fusion, and muscle balance, were made by specialists from the University of California School of Optom-

10. Eames, Thos. H., "Frequency Study of Physical Handicaps in Reading Disability and Unselected Groups," *Journal of Educational Research.*

11. *Ibid.*, p. 4.

12. Selzer, Charles A., *Lateral Dominance and Visual Fusion.* Harvard Monographs in Education 12. Cambridge, Massachusetts, Harvard University.

13. *Ibid.*, p. 85.

14. Farris, L. P., "Visual Defects as Factors Influencing Achievement in Reading," *California Journal of Secondary Education,* 10, October, 1934, pp. 50-1.

etry. Children with defective vision were matched with a control group having approximately equivalent chronological and mental ages. Farris concludes that: (a) Hypermetropia and strabismus are associated with less than normal progress in reading; (b) Myopia and myopic astigmatism are associated with greater than normal progress; (c) Pupils whose visual perception is monocular make progress in reading superior to those whose visual perception is binocular but who have difficulty in coordination; (d) Minor eye defects have but little effect on reading progress; (e) Corrective lenses aid in achievement in reading in a statistically reliable number of cases; (f) Emmetropia does not necessarily lead to reading efficiency.

P. A. Fendrick[15] in 1935 studied the visual characteristics of sixty-four pairs of poor and good readers in grades two and three of several New York City schools. Tests were administered on ocular relations in the following general classifications: non-professional clinic tests; telebinocular tests; professional optometric examinations; and tests of visual perception. The following is a summary of his conclusions:

a. "A statistically significant difference was isolated favoring good readers that indicated better-than-normal visual acuity for distance vision in the right eye. Although the differences became much less marked for children taught by the phonetic method, it was even more striking when good and poor readers taught by the non-phonetic method were compared. Differences were found that indicated better visual acuity in the left eye in binocular vision for good readers, but were not so significant as the right-eye measurements.

b. "Normal visual acuity at 16 inches definitely manifested significant differences for right-eye and binocular vision that favored good readers taught by the look-and-say method. The differences between pupils taught by the phonetic method were statistically unreliable. (Telebinocular tests confirmed this.)

c. "No significant differences were isolated through any consideration for lateral muscle-imbalance at distant and near fixations.

d. "Professional optometric examinations revealed that 75 per cent of the good readers taught by the non-phonetic techniques had normal vision, while only 50 per cent of the poor readers had normal vision.

e. "Differences favoring the good readers were manifest on the mean scores of all perception tests, although strict statistical significance could not be attached to two of the test results."[16]

The general conclusion given by Fendrick is:

"It is evident from this summary that, among the attributes associated with reading disability, the visual characteristics should receive definite attention. This consideration should be particularly pertinent in connection with symptoms of reading disability arising in schools where the look-and-say method of teaching reading is dominant. Although ametropia exists among pupils not manifesting reading disability, its existence cannot be condoned as its presence unnecessarily handicaps the child even though immediate effects may not be evident."[17]

15. Fendrick, Paul A., *Visual Characteristics of Poor Readers*, Teacher's College Contributions to Education, 1935. Teachers College, Columbia University.
16. *Ibid.*, pp. 47-8.
17. *Ibid.*, p. 51.

Dr. R. Morse-Peckham[18] published a study in 1936 of an investigation of visual efficiency and scholarship of 10,000 school children. He found that if students were classified into three groups, (a) visually efficient, (b) visually inefficient, (c) definitely handicapped, and the percentages in each group compared for fast and slow readers that there exists an important correlation between visual defects and reading ability. He also notes a rapid decrease of fast readers with a decrease in visual efficiency and that there are more visually-efficient fast readers than slow readers. He states further that there is a good correlation between vision and scholarship, especially good vision being found among "A" students.

Brant Clark has reported a series of studies on the effect of binocular imbalance on the behavior of the eyes during reading. In one article[19] he describes the photographic methods he used in some of his studies. In 1935 an experimental investigation[20] was made, comparing the binocular behavior by means of eye-movement photography of eleven students manifesting exophoria between twelve and sixteen prism diopters at the reading distance and another group of eleven matched on a basis of sex, reading comprehension, and linguistic ability who manifested approximately normal binocular balance (zero to two prism diopters of exophoria at the reading distance). The following is a summary of his conclusions:[21]

a. "There was no significant difference between the two groups in regard to the number and duration of fixations and regressions per line.

b. "There was no significant difference in the time required to complete divergence movements at the beginning of the line.

c. "When the dominant and non-dominant eyes are compared as to the time required to complete the divergent movements, it was found that there was no significant difference.

d. "A relation between binocular imbalance, fusion movements, and ocular dominance is suggested by the fact that sixty-five per cent of the subjects made significantly larger divergence movements with the non-dominant eye.

e. "The exophoric group made greater divergence movements at the beginning of the lines. These divergence movements probably cause enough excess reading fatigue to be considered important from the point of view of remedial reading."

In a later study, Clark[22] examined six subjects who exhibited high exophoria (fifteen to twenty-four diopters at the reading distance) by

18. Morse-Peckham, Ray, "An Investigation of the Visual Efficiencies of 10,000 School Children and the Correlation of Vision and Scholarship," *American Journal of Optometry*, Vol. 13, No. 9, September, 1936.

19. Clark, Brant, "Photographic Measure of Accommodative Convergence," *American Academy of Optometry*, 10, 1936, pp. 120-33.

20. Clark, Brant, "Effect of Binocular Imbalance on the Behavior of the Eyes During Reading," *Journal of Educational Psychology*, 26, October, 1935, pp. 530-38.

21. *Ibid.*, p. 537.

22. Clark, Brant, "Additional Data on Binocular Imbalance and Reading," *Journal of Education Psychology*, 27, September, 1936, pp. 473-75.

the same methods as used in the above reported study. These students in contrast with the previous group, were suffering ocular discomforts as a result of the faulty condition of their eyes. From this study he concludes:[23]

a. "The exophoric group made greater divergence movements at the beginning of the lines (and the differences were statistically significant.)
b. "The exophoric group required a significantly greater amount of time to complete these divergent movements.
c. "The large divergent movements of the subjects with high binocular imbalance probably cause enough fatigue to be important in a remedial reading program.
d. "Other ocular factors than the high exophoria may also be important in causing these large divergent movements."

Witty and Kopel, in a comprehensive review of the literature and on the basis of their own research, cited earlier in this paper, conclude that:[24]

"The poor readers are not characterized by a greater incidence of visual defects and anomalies than are good readers. Furthermore, the various visual factors—slow fusion, no fusion, lateral muscle imbalance, deficient acuity, and ametropia, singly or in combination—appear to be unrelated to reading deficiency."

But they go on to say that

"Nothing in this conclusion should lead one to minimize the importance of good vision for optimum physical efficiency and achievement of both poor and good readers. Moreover, visual defects may, in individual cases, seriously impede the reading process or contribute to its disfunction."

B. Crider[25] in 1934 reported an investigation on the interrelation of certain visual functions. The stereoscope technique of Selzer[26] was used for alternating vision; eye muscle imbalance was determined monocularly by the technique of Mills;[27] dominance was investigated by unilateral sighting performances. He found, in general, that the preferred eye as judged by the alternating vision test was the one with the most efficient musculature as judged by the imbalance tests, also that the eye with the least imbalance was in almost all cases the dominant eye. Crider quotes from Selzer as follows:[28]

"Lack of fusion is due to muscle imbalance that has existed from birth or early infancy."

Crider then concludes that fusion is associated with imbalance. Thus,

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23. *Ibid.*, p. 475.
24. Witty and Kopel, *op. cit.* 5, pp. 669 and 670.
25. Crider, Blake, "Certain Visual Functions in Relation to Reading Disabilities," *Elementary School Journal*, 35, December, 1934.
26. *Op. cit.*, 12.
27. Mills, Lloyd, "Eyedness and Handedness," *American Journal of Ophthalmology*, 8, December, 1925, pp. 933-41.
28. *Op. cit.* 12, p. 85.

he states that eye dominance, binocular imbalance, alternating vision (suspenopsia), and fusion are interrelated and seem to be dependent on some common phenomenon.

In a recent article (1938), Tinker[29] reports a research on the motor efficiency of the eyes as a factor in reading. The purpose of the study was to measure accuracy of oculomotor control as manifested by accuracy of voluntary fixations during successive perceptual acts, measure speed of convergence and divergence during successive visual fixations, and to ascertain the relation of the above measures to speed of reading and eye-movement measures of reading. A total of sixty-four students were examined. No significant correlation was found between accuracy of visual fixations and measures of reading proficiency.

"When extremes alone of the group are compared, there appears to be a slight and consistent relation between motor efficiency of the eyes and reading ability."[30]

That is, greater oculo-motor efficiency in fixation is accompanied by faster reading in the reading test and in the selection photographed. In general, slightly fewer fixations and regressions are made by the group with greater oculo-motor efficiency, and the fixation pauses tend to be slightly shorter for the same group. Although the trends seem to be fairly consistent from one reading measure to another, no difference is striking.

*Selections From the Literature Pertaining to the Habits Training Method*

An examination of the literature of the second or HABITS TRAINING METHOD, that is, where the specific oculo-motor habits of reading are trained, reveals still a greater controversy and, as stated before centers around the question of the efficacy of peripheral motor training in aiding the maturation of certain reading habits.

After surveying the reading habits of students in a Columbus, Ohio, school in 1925, Pollock and Pressey[31] selected ten cases for intensive investigation. With intelligence controlled, they state that the differences in ability seem dependent to a large degree on the formation and integration of certain mechanical habits. They go on to postulate:[32]

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29. Tinker, Miles A., "Motor Efficiency of the Eyes as a Factor in Reading," *Journal of Educational Psychology*, 29, March, 1938, pp. 167-74.
30. *Ibid.*, p. 174.
31. Pollock, M. C., and Pressey, L. C., "An Investigation of the Mechanical Habits in Reading of Good and Poor Readers," *Educational Research Bulletin*, 4, 1925, pp. 273-75.
32. *Ibid.*, p. 275.

"It is reasonable to suppose that most children can acquire these habits if they were specifically taught . . . making sure that the children have the habits and skills necessary for good reading."

It is interesting to note a subsequent study by Traux and Pressey[33] in 1928. Using children in the fourth grade as subjects, one group was allowed to continue the usual course in reading; the other was carefully examined for deficient visual habits and then given special training in these skills. The experimental group was instructed in the nature of eye movements and their own particular errors. These students first practiced fixating with regular rhythm three times across a line—at the beginning, the middle, and the end of the line—and making regular swings back to the beginning of the next line. This was followed by reading light material with emphasis on comprehension but trying to keep up regular fixations. This group showed significantly greater gains though part of the gain is attributed by the authors to motivation, not training of habits. The present manual for developing reading ability for freshmen by Pressey[34] also contains lines with crosses to practice fixations and to develop regular rhythmic movements and smooth accurate back swings. Other things included are spaced words and lines marked with points to be fixated.

F. P. Robinson[35] in 1933 reported results on twenty-one college freshmen in an experiment on the "pacing" of eye movements. His methods of training eye movements were spacing words for the purpose of forcing spaced fixations and discouraging regressions, underlining certain words in a selection to designate fixation points, and also skimming exercises. Comparison of the initial and final scores of students on the reading tests shows that[36]

"Rate of reading is markedly improved, more words are taken in at each fixation, fewer regressions are made within the line, greater accuracy is attained in hitting the first of the line, the variability of duration of fixations is reduced, and lip and head movements are reduced."

These are shown to be statistically significant, while the comprehension tests show slight, but not significant gains. Many extraneous factors were evaluated experimentally to show that the training in "pacing"

33. Traux, M., and Pressey, L. C., "The Value of Drill in the Mechanics of Reading," *Educational Research Bulletin*, 7, 1928, pp. 310-12.
34. Pressey, L. C., *A Manual of Reading Exercises for Freshmen*. Ohio State University Press, Columbus, Ohio, copyrighted 1928.
35. Robinson, Francis P., "The Role of Eye Movements in Reading with an Evaluation of Techniques for Their Improvement," *University of Iowa Studies, Series on Aims and Progress of Research*, June, 1933, pp. 3-52.
36. *Ibid.*, p. 15.

accounted for the gains. The case for those advocating eye movement training is summed up by Robinson thus:[37]

"Habits of eye movements affect reading ability. Inferior habits of eye movement, built up in the first attempts at learning to read and carried over into adult reading, represent functional limitations to reading efficiency beyond which progress cannot be made, even though the other functions determining reading ability may permit it. These habits can be improved by reading in a situation that demands efficient action of eye movements over a period of practice, with a corresponding improvement in reading ability. Accordingly, they may be defined as psycho-physiological dispositions to move the eyes during reading, in a more or less constant manner according to certain cues, mostly kinaesthetic, that act independently of the conscious act of understanding the material so long as comprehension progresses smoothly."

Taylor[38] in a book reviewing training and photographing devices gives the results of a study on controlled reading. He states that[39]

"All experimentation in the field of reading has shown the desirability of controlled reading . . . reading in which the mechanical processes are directed and coordinated with the interpretive processes."

He also remarks in the conclusion[40]

"Many of the problems of maturation or reading readiness probably would be eliminated if children were taught how to control and coordinate their eye-movements before the actual reading process is undertaken. The children in the primary grades have not yet learned to coordinate their visual apparatus. They have no conception of how to attack printed material, and this novel activity of moving the eyes in a left-to-right movement, as in book reading, must be conditioned."

Book[41] in an article on developing reading habits contends that greater efficiency in reading rate depends in the first place upon the development of "proper" habits and eye control. Marking points on a line to designate points to be fixated in reading is considered advisable by this author.

In 1935, Blake and Dearborn[42] published an article on a reading experiment at Smith College in which 104 students were given special tests. In respect to vision, they found a greater degree of defective vision in the experimental group (retarded readers) than in the control group (normal). They advised the use of the marked line and spaced-cross techniques outlined in the Pressey manual.[43]

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37. *Ibid.*, p. 43.
38. Taylor, Earl A., *Controlled Reading, A Correlation of Diagnostic, Teaching, and Corrective Techniques*. Chicago: University of Chicago Press, 1937. pp. 367.
39. *Ibid.*, p. 152.
40. *Ibid.*, pp. 156-7.
41. Book, W. F., "The Development of Higher Orders of Perceptual Habits in Reading," *Journal of Educational Research*, 21, 1930, pp. 161-76.
42. Blake, Mabelle B., and Dearborn, Walter F., "The Improvement of Reading Habits." *Journal of Higher Education*, 6, February, 1935, pp. 83-88.
43. *Op. cit.*, 34.

W. S. Gray[44] remarks in a monograph on remedial reading that ineffective eye movements; failure to establish regular left-to-right movements and accurate return sweeps; are among the specific causes of failure in reading. In his outline of remedial procedures, he suggests specific training in the mechanics of reading directed at such defects as: inaccurate word recognition, narrow span of recognition, irregular eye movements and inaccurate return sweeps. And, he further suggests that as soon as one gets progress in mechanics, then opportunity for incorporating these ideas and habits in reading activities should be provided.

A recent article (1939) by R. B. Lee[45] considers the value of the metronoscope in teaching reading. Using this instrument, a mechanical, triple-shutter tachistoscope, to direct the eyes in "correct" left-to-right sequence, discourage regressions, decrease fixations, and speed up perception, the author gave regular and remedial training to students in the Brownwood, Texas, schools. Tests were made with the ophthalmograph and standardized reading tests. These students were compared to other students at the same grade level (basis of comparable groups and number not reported). After eight and one-half months of training, the pupils in the experimental group made scores 10.7 per cent to 94.8 per cent better than the controls. The comprehension was 10.9 per cent to 39.9 per cent better for the experimental group. The number retained in the first grade was reduced from 20.6 per cent to 9.6 per cent and at the end of the first year of training 97.3 per cent of the first-grade pupils reached the norm for that grade on the Haggerty Reading Test. Fifty per cent reached the norm for the second grade. The technique was that outlined by Taylor[46] and included eye-movement habit training but no attempt was made to evaluate this factor separately.

In one of the basic studies of the development of eye-movement habits, Buswell, in 1922 analyzed photographs of the eye movements of students in the primary, elementary, and secondary schools.[47] He is convinced that the photographs show more than just motor habits and

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44. Gray, William S., with cooperation of D. Kibbe, L. Lucas, and L. W. Miller, *Remedial Cases in Reading: Their Diagnosis and Treatment*, Supplemental Educational Monographs, 22, 1922. Chicago, University of Chicago.

45. Lee, R. B., "Value of Metronoscope Reading," National Elementary Principal, 18, No. 3, February, 1939, pp. 109-111.

46. *Op. cit.*, 38.

47. Buswell, Guy T., *Fundamental Reading Habits: A Study of Their Development*. Supplementary Educational Monographs. 21. Chicago, University of Chicago, 1922, p. 150.

really give clues to the central processes. He states that eye movements are the results, not causes, of maturation. Factors cited by him as showing the dominance of the central processes over oculo-motor habits are: size of type which only slightly influences movements, though if movements were limited by sensory accommodations, then there should be a change; confusion in central perception and meaning is accompanied by confusion in eye movements; strange and foreign words in the context cause variations from the regular habits; the difficulty and type of material shows a direct relation to the eye movements.

M. A. Tinker supports Buswell's point of view and states:[48]

"The character of the eye movements indicate to some degree the nature of the perceptual processes during reading. Eye movement habits are very flexible and appear to adjust themselves readily to any change in the perceptual processes involved."

He takes the stand[49] that eye movements are simple manifestations of cerebral functions. Inefficient reading is accompanied by characteristic oculo-motor behavior, including long fixation pauses, irregular sequence of fixations, reversals, etc., Peripheral motor habits are not determinants of central perception but merely symptoms of central processes. Tinker points out that most training techniques based on improvement of eye movements also train motivation, span of recognition, and speed. Other techniques not based on habit training achieve just as much by training central perception and find that eye movements improve. He states that changes in perception and apprehension control eye movements and concludes that eye-movement training and study are not necessary to a remedial reading program. In a summary study of the role of eye movements in reading, Tinker lists authorities on both sides and then concludes:[50]

"The measurement of eye movements may be dispensed with in the reading clinic and that "pacing" eye movements may be omitted without lessening the effectiveness of the remedial instruction."

A. I. Gates in 1929 states in his book on reading:[51]

"It cannot be said with assurance that inappropriate eye movements are the primary cause of slow reading even if they accompany such reading. Probably the irregular eye movements and slow reading are the joint results of other factors.

48. Tinker, Miles A., "Use and Limitations of Eye Movements in Reading," *Psychological Review*, 40, 1933, p. 383.

49. Tinker, Miles A., "The Role of Eye Movements in Diagnostic and Remedial Reading," *School and Society*, 39, 1934, pp. 147-48.

50. Tinker, Miles A., "Eye Movements in Reading," *Journal of Educational Research*, 30, December, 1936, p. 256.

51. Gates, A. I., *The Improvement of Reading*. New York: Macmillan, 1929, pp. 233-34.

Remedial work, then, directed exclusively to correct eye movments, might be expected to be futile."

And Whipple states:[52]

"I do not myself feel sure that these peculiarities of eye movement in fast readers are in any way an explanation of their superior speed, but am inclined to consider them as mostly an expression or symptom of a higher speed of assimilation."

A study by Sission[53] in 1938 compared the results of training eye movements themselves with training via more motivated reading. Thirty students, selected on the basis of low ability on the Chapman-Cook Speed of Reading tests, were divided into three equated groups. One group was given training drawn largely from the Pressey manual. Attention was directed toward eye movements and a page of spaced crosses and selections in which the points to be fixated were marked. The second group participated in motivated reading only. Tests were also made before a camera and eye-movement data obtained. The results show a slightly larger per cent increase for the first group in all phases measured except pause duration. This difference was explained by the author as due to the difference in attention to eye-movement factors in the two groups when before the camera. On the basis of certain ratings, the first training group gained twelve per cent in comprehension while the motivated group gained seven per cent. In summary, he states:[54]

"Eye-movement training is no more efficacious as regards reading rate than mere reading with interest to improve; and it may, through directing the reader's attention to the mechanical processes of ocular movements, detract from the understanding of what is read."

*Selections From the Literature Pertaining to the Orthoptic Method*

Most of the work in this field has been of a clinical or theoretical nature, extremely little experimental evidence being available. Jaques combines clinical experience with theory in a book of refraction and orthoptics in which he indicates the purpose of orthoptics by the following:[55]

"A certain percentage of them (patients) are inefficient or insufficient in some department of seeing that cannot be reached by . . . fitting corrective glasses. It is toward the building up of, enlarging, reinforcing, and refining these abilities that orthoptics is directed."

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52. Whipple, G. M., "Eye Movements in Reading," *Education*, 33, 1913, p. 558.
53. Sisson, E. D., "Eye-Movement Training as a Means of Improving Reading Ability," *Journal of Educational Research*, 32, September, 1938, pp. 35-41.
54. *Ibid.*, p. 40.
55. Jaques, Louis. *Fundamental Refraction and Orthoptics*. Los Angeles: Globe Printing Company, 1936, p. 141.

Some of the methods suggested by Jaques for office practice are: diplopia exercises using base-up and down prisms to obtain dissociation which is aimed at eliminating suspensions and suppressions as well as amblyopia-exanopsia and flash-type training. He describes the latter as follows:[56]

> "Each time the light comes on . . . focus and adduction (convergence being the combination of the two) takes place . . . in the interest of clear vision and in the interest of single vision. As the light goes on and off, there is a rhythmic tug and let go; a perfect exercise for the adduction."

Rotational exercises are also suggested as supplying the following benefits:[57]

> (a) "An increase in the blood supply to the eyes and orbit which is beneficial. (b) Handicaps fixation and trains it to hold fusion under difficulties."

Stereoscopic training with a telebinocular was also suggested for building fusion and stereopsis, that is, fine binocular adjustments.

Taylor[58] reports an investigation of three students who suffered visual discomfort that were given reading exercises on the Metron-O-Scope while looking through prisms. This training was designed to produce comfortable efficient vision and mature reading habits by means of developing a range of function of fusion and duction. These ranges were increased, the reading ability improved, and comfort secured by the use of the various powered prisms employed. He states:[59]

> "The success of this experiment suggested the possibility that a properly developed technique of prism reading could be used in remedial reading work, not only in reading clinics in educational institutions but in the office practice of eye specialists, for those cases who cannot respond to classroom procedures because of certain functional deficiencies of the visual apparatus."

He states further on the same page:

> "At the time of this investigation (1936), very little of an experimental nature, giving any tangible suggestions in regard to methods for dealing with functional deficiencies relating to reading disability, had been reported."

In a later study[60] Taylor gives data gathered from twenty-five cases showing reliable differences in reduction of fixations and regressions and increase in rate and substantial increase in comprehension when the criterion was the development of certain ranges and ratios of abduction and adduction.

Betts, often attempting to explain some of the contradicting

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56. *Ibid.*, p. 155.
57. *Ibid.*, p. 158.
58. *Op. cit.*, 38, pp. 234-251.
59. *Ibid.*, p. 249.
60. *Ibid.*, pp. 268-284.

studies of the relation of vision to reading and after summarizing the work in relation to certain eye conditions, suggests:[61]

> "Eye-training exercises with special stereograms are used widely for the correction of eye coordination difficulties. It is possible, therefore, that schools might endeavor to prevent some of these (visual) difficulties by daily use of appropriate stereographs . . . the children can profit physically by the exercises and eye recreations which aid in developing and maintaining the coordinate functioning of the eyes."

It is evident from the foregoing that the study of the relation between orthoptic training and reading ability is a research in a new field. Thus far, the following seem evident:

a. Fixed habits and certain limitations in function of the visual apparatus, including refractive and coordinative deviations, may retard or inhibit the full development of reading ability in individual cases, even though a correlation between such items may be relatively low when determined from group measurements.

b. Even though no research of an exact and controlled nature is available, most authorities agree that the correction of visual errors and deficiencies will lead to improvement in reading ability in both "poor" and "good" reader groups.

c. No single factor or group of factors, either central or peripheral, can be isolated as the primary cause of reading success or disability.

d. The MEASUREMENT METHOD has yielded controversial evidence on the importance of certain visual factors but the gross errors are generally regarded as contributing to retardation.

e. Training of the visual apparatus in regard to reading has largely been confined to training of the eye-movement habits used in reading without any, or with very little, regard for the condition of the visual mechanism.

f. The ORTHOPTIC METHOD of developing an efficient visual mechanism is, therefore, a consideration of the psycho-physiological and physical condition of the visual apparatus not from a measurement point of view, not from a habits training point of view, but with the single purpose of developing the most efficient mechanism possible to remove, insofar as practicable, any peripheral limitations which might exist.

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61. Betts, E. A., "Visual Aids in Remedial Reading," *Educational Screen*, 15, April, 1936, p. 110.

# PHYSIOLOGICAL LIMITATIONS ON THE FUNCTIONAL PRODUCTION AND ELIMINATION OF AMETROPIA*

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## INTRODUCTION

Recently there has been advanced a theory suggesting that ametropia results largely from functional changes in the neuro-muscular apparatus of the eye, and that it is possible to correct a large amount, if not all, of such ametropia, by changing existing physiologic functional relationships through orthoptics or similar procedures. It is the purpose of this paper to examine this premise briefly on the basis of the available innervational control and to assign limits, if possible, to the degree of ametropia that admits of correction by such procedures.

In a previous paper[1] the writer reviewed the control of accommodation for both distance and near vision. The present information concerning the control of focus for the eye seems to indicate that both the sympathetic and parasympathetic divisions of the autonomic nervous system act in adapting the refractive state of the eye to allow clear vision for the various fixation distances. In general the parasympathetic is excitatory to the circular fibers of the ciliary body causing an increase in the refractive power of the eye necessary to adapt the eye visually for near objects. The sympathetic is inhibitory to this latter function on a reciprocal innervation basis, and is excitatory to the longitudinal fibers

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1. K. B. Stoddard. Accommodation and Autonomic Innervation of the Anterior Segment of the Eye. American Journal of Optometry and the Archives of the American Academy of Optometry, Vol. 19, No. 2, 1942.

of the ciliary body and possibly the radial fibers of the same structure as well. Stimulation of the longitudinal fibers via the sympathetic nervous system together with inhibition of parasympathetic innervation to the circular fibers of the ciliary body results in a decrease in the refractive power of the eye, thereby adapting it for distance vision. The initial sensory stimulus for focus control is presumably the recognition of blurred retinal imagery by higher cortical centers.

In the evidence presented, the increase in refractive power of the eye by maximal parasympathetic stimulation is of the order of ten diopters relative to the basic refractive state. While this so-called basic refractive state is really the refractive state of the completely denervated eye, for practical clinical purposes it may be defined as the refractive state of the eye under normal tonic innervation of the ciliary body by both branches of the autonomic nervous system. Maximal stimulation of the ciliary body by way of the sympathetic results in a reduction of the refractive power of the eye of the order of one diopter with respect to the basic refractive power. These innervational limits indicate the total possible change in the ocular refractive power that can be brought about by maximal faradic stimulation of each branch of the autonomic nervous supply to the eye separately. As discussed previously, these results were obtained by measurements upon experimental animals which included the cat, dog and monkey.

It is probable that these results are applicable to humans with little change. This point has been discussed[2] in connection with the sympathetic innervation to the ciliary body. As far as refractive changes resulting from parasympathetic innervation is concerned adequate verification is obtained from clinical measurements of the monocular accommodative amplitude upon individuals who have not entered the presbyopic state.

Except for the very young, maximal *physiological* innervation (particularly sympathetic innervation) is insufficient to reach the above refractive limits, which it must be emphasized were obtained under special experimental conditions. These conditions were maximal *faradic* stimulation of one autonomic nervous pathway after the opposing nervous pathway had been cut. The effect upon the refractive state would necessarily be slightly greater for these conditions than with maximal physiological stimulation of one branch of the ocular autonomic nervous

supply and reciprocal inhibition of the other branch.

HYPERMETROPIA

Hypermetropia is the refractive state that exists when the antero-posterior dimension of the eye is too small for the refractive power of that eye. Theoretically this may be brought about in two ways. One of these requires a lack of adequate development or growth in the eye that results in an eye too short for an essentially normal refractive system; the other requires an essentially normal ocular length and a refractive system deficient in refractive power for this length. In the former case the hyperopia is anatomic, in the latter case it is anatomic if the refractive deficiency is due to an inherently low-powered refractive system. If, however, in the latter case the refractive deficiency results from imbalance in the autonomic innervation to the ciliary body then such hyperopia is functional and not anatomic. On the basis of the introductory discussion it is conceivable that hyperopia approximating one diopter might be due to innervational imbalance where the sympathetic innervation dominates the parasympathetic constantly to the maximum extent. This would require maximal sympathetic stimulation with complete reciprocal inhibition by the parasympathetic. For this to occur, except momentarily, is physiologically impossible in the normal individual. From this type of reasoning it can be seen that if hyperopia is due to functional changes in refractive power on a constant basis, it must be much less than one diopter and probably cannot exceed one quarter to one half a diopter. It follows that probably all hyperopia greater than one half a diopter and certainly all hyperopia exceeding one diopter is definitely anatomic and not functional.

The mechanism for overcoming the effect of hyperopia functionally is present, at least in the young. An increase in the refractive power is necessary to neutralize the optical effects of hyperopia and this occurs by parasympathetic stimulation of the ciliary body with reciprocal inhibition of the same structure by the sympathetic. This is the same physiological change which adapts the eye for near vision and whether or not it can be maintained for long periods of time without discomfort depends upon many factors, among them individual tolerance to unbalanced autonomic innervation, and the actual degree of hyperopia.

EMMETROPIA

Emmetropia is the *theoretically* ideal refractive state. Whether or

not this is the ideal *physiological* refractive state is a moot question, but as far as this discussion is concerned emmetropia presents no problem since by definition it is not a state of ametropia.

MYOPIA

In the consideration of hyperopia and emmetropia there seems to be little divergence of opinion. However, as soon as the myopic refractive state is considered there is an immediate and sharp divergence of opinion as to the actual anatomic and innervational contribution to the production of myopia. On the one hand there are refractionists who feel that myopia results largely from unbalanced autonomic innervation to the ciliary body in which the parasympathetic nervous system is in a state of constant excitation, and on the other hand those who feel that myopia is largely an anatomic and structural change, probably associated with abnormal growth processes particularly prominent during adolescence. It seems desirable to examine the status of the myopic refractive state making use of the present knowledge of the innervation to the ciliary body.

Theoretically myopia can be produced in two ways. One way is to have excessive parasympathetic ciliary innervation relative to the sympathetic resulting in an increased refractive power of the eye similar to that which occurs when the eye adapts itself for near vision. Myopia due to this cause is termed functional or pseudo myopia. The other way to produce myopia is to have the antero-posterior axis of the eye become elongated due to abnormal growth processes or other causes without a commensurate decrease in ocular refractive power,—or an increase in the refractive power of the eye that is not due to innervational imbalance with no change in the antero-posterior dimension of the eye. Myopia produced in this manner is called true or anatomic myopia.

MODERATE AND HIGH MYOPIA

For purposes of discussion it seems desirable to consider the various degrees of myopia separately. Let us consider first myopia greater than two diopters. In many of these cases one observes a temporal conus or myopic crescent in examining the fundus. In the higher degrees of myopia extension of these retinal stretch degeneration processes may result eventually in a posterior staphyloma or retinal detachment. It seems apparent that these findings are presumptive evidence of elongation of the eye. It is improbable that these myopic states can be assigned to innervational

imbalance as the discomfort arising from this marked imbalance existing over a long period of time would be notable in a large proportion of the cases. Such, however, is not the case. If myopia of high degree were due to functional innervational causes a significant reduction in the monocular accommodative amplitude would be observed. This is not usual. Thus it appears probable that the majority, if not all, of the higher myopias are true or anatomic myopic states.

If these observations are true and such myopia is anatomic, attempts at functional correction would be limited by the available adjustment in the neuro-muscular control of focus. From previous discussion a reduction in a basic myopic refractive state can only occur by reducing the refractive power of the eye. This requires innervation to the ciliary body by the sympathetic, with reciprocal inhibition by the parasympathetic. The limiting change in refractive power by this mechanism is of the order of one diopter, and as shown above is probably much less.

This means, therefore, that any attempt on the part of the individual to correct functionally an existing *anatomic* myopia must of necessity be limited to an amount less than a diopter. Even this amount would require a marked imbalance in autonomic innervation that could not be maintained constantly. Attempts to correct existing true myopia by orthoptics or similar means are also subject to the above limits. It seems fairly obvious that attempts to *eliminate* myopia of high degree functionally by orthoptics or similar means will fail.

One occasionally reads enthusiastic articles in which practitioners, by orthoptics or the use of refractive procedures in conjunction with orthoptics, claim to have reduced or even eliminated moderate or high myopia. The writer has had the opportunity to examine several of these patients before and after the orthoptic procedures and has been unable to detect any change in the refractive state. It is true that some of these patients show an apparent increase in visual acuity, but this can be assigned to a learning process whereby the individual has learned to recognize blurred outline by practice. This type of recognition constitutes a type of contour acuity. It is not identical with the ordinary visual acuity. It may be argued that if the patient can recognize letters it is a visual acuity, but the point must not be lost sight of that he attains this ability by prolonged practice with familiar objects, and if an unfamiliar object be used, this type of contour acuity is less valuable. This point

can be tested readily by changing the type of test characters. With an unfamiliar type of letter or with one of the test charts using the multiple circle or broken circle for test characters the visual acuity shows little change, even with practice.

LOW MYOPIA

In myopia of low degree, less than two diopters, the situation is not quite as definite. In this range of myopia both functional and anatomic myopia can occur. Differentiation between the two types in this range is many times extremely difficult. One can usually infer, however, from the various binocular measurements performed in the clinical examination, into which group the myopia falls, whether it be pseudo or real myopia. It is not the purpose of this paper to discuss this differentiation as it properly falls into refractive clinical analysis.

Recently[2] the field of myopia, with particular reference to its orthoptic reduction, was the subject of an investigation at the University of California. A number of patients exhibiting myopia of low degree (less than two diopters) were examined with and without a cycloplegia. Following this examination refractive and orthoptic procedures were used in an attempt to reduce the myopia. The procedures used were those now in current clinical use. The results of this investigation are notable.

In those patients in whom the refractive state under cycloplegia was less myopic than without cycloplegia, orthoptic training resulted in a reduction of the myopia finally. In those cases which showed essentially the same refractive state with or without cycloplegia no improvement in the myopia was obtained by orthoptic procedures. It should be reemphasized at this point that these myopic cases were of low degree where a larger percentage of pseudo myopes might be expected.

In the Optometry Clinic of the University of California students exhibiting functional or pseudo myopia, apparently resulting from excessive study or faulty study habits, are fairly common. These cases of myopia, most of which do not exceed three-quarters of a diopter, usually respond readily to orthoptics or similar procedures. Differentiation between true and pseudo myopia of such low degree is difficult at times without an examination under cycloplegia, and routine orthoptics in an attempt to reduce myopia of low degree seems justified. If the myopia

2. Jerome Chance, Master's Thesis in Physiology, University of California, 1941.

is favorably influenced by such treatment that portion actually eliminated was presumably pseudo myopia, as previous discussion has shown that elimination of anatomic myopia by functional means on a constant basis is improbable. Myopic states not changed by orthoptic or similar procedures are presumably true or anatomic myopia.

SUMMARY

On the basis of available innervational control of change of refractive power of the eye it seems probable that all hyperopia in excess of one-half diopter is anatomic. Hyperopia less than one-half diopter may be anatomic or functional with the probability favoring anatomic hyperopia.

Myopia greater than two diopters is probably mainly anatomic and attempts to correct such *anatomic* or *true* myopia by orthoptic or similar procedures are futile, as the available neuro-muscular focussing apparatus is incapable of supplying a sufficient change in refractive power. Myopia less than two diopters may be either functional or anatomic with the probability that practically all the functional or pseudo myopic states are less than one diopter. Pseudo myopia can be eliminated by orthoptic means and such procedures should be routinely used when low myopic states are encountered. Attempts to functionally correct true myopia even of low degree on a constant basis are futile.

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## ACADEMY ASSIGNMENTS DURING A PERIOD OF EMERGENCY

During the past 20 years the American Academy of Optometry has repeatedly demonstrated its value to the profession. Standing as it has for several decades, firm in its knowledge and belief, that optometry can only be practiced successfully amid professional surroundings and under the most rigid ethical standards; and assisting in the advancing of technical skills and refractive knowledge through various mediums as it repeatedly has; this organization has won for itself a measure of leadership based upon sound thinking and purposeful planning for *all* optometrists.

The war finds the Academy ready to continue its work, and also ready to meet the new needs and responsibilities which logically fall upon a technical society in times of emergency. Under excellent leaders and with an ever growing membership, the Academy faces this period of war and the reconstruction era which will follow, with the determination that optometry shall continue its advances both on the economic and technical fronts. To this end, the Academy is pledged:

1. To continue our efforts to develop new and improved techniques of ocular diagnosis and refractive procedure.
2. To continue our efforts to develop improved methods of patient control and efficient office procedure.
3. To join with other optometric and ophthalmologic societies in making every effort to keep the consumer costs of eye care at minimum levels.
4. To assist in the development of projects which will assure as wide a distribution of optometric practices as possible, to the end that each county in every State is adequately served by optometrists who, in war times, must bear the brunt of eye care programs for the civil population.
5. To plan now for the re-establishment in private practice of those optometrists now in the armed services of their country, and
6. To assist in coordinating refractive health programs for the indigent and medically indigent as these programs relate to local and state-wide health care projects.

Academy Committees are at work on these assignments. Where possible, President Wheelock has promised that progress reports will be presented to the profession at the annual meeting of the American Academy of Optometry which will be held in August of this year at Toronto.

CAREL C. KOCH.

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## A MILITARY-PERIOD PRACTICE MERGER PLAN TO ASSIST THE OPTOMETRIST WHILE IN SERVICE

Approximately a year ago, the writer[1] discussed briefly the manner

1. Koch, Carel C. Official Assistance for Optometrists in Military Service. American Journal of Optometry and Archives of American Academy of Optometry. Vol. 18, No. 2, pp. 95-96. 1941.

in which some private optometric practices could be held together, for the duration of the war while the principals in these practices were absent in the armed services of their country. Certainly our younger practitioners who enter the services have the right to expect from those who remain at home, some measure of assistance, and if this can be furnished in the proper manner, as to hold together the younger man's practice while he is away and in such fashion as to have the practice returned to him when the war is over, we have made his tour of duty somewhat easier. And we know too, that the older practitioners are anxious to do what they can to assist both their country, in this time of need, and also their fellow optometrists.

A year ago the writer suggested that in his judgment, "such service may well consist of assistance in arranging for the continuance of the refractive practice of the optometrist who enters military service by setting up an association, Supervisory-Practice-Service, which would in each division or zone of the state, arrange for (1) professional assistance to carry on the refractive practice during the period of the war, or the period of training, using the present offices of the optometrist in service; or arrange for (2) a Military-Period Practice Merger, in which the name of the optometrist who was serving with the colors, was associated with an older practitioner in the same or nearby town, who remained at home and who would attend to both the younger man's practice as well as his own. In each case, suitable financial arrangements could be made to make such a program attractive to both men."

Since this suggestion was originally made, a considerable number of optometrists have entered military service. Yet we find in most states our societies have taken no steps to render this needed service for them. The reason for this lack of activity is, that most of our societies are without the professional staff background, necessary to adequately function in setting up a zone Supervisory-Practice-Service within their state association. As it now seems probable that nothing will come of the first portion of this suggestion, it is well to turn our attention to the second or alternate suggestion, that having to do with the Military-Period Practice Merger.

The latter suggestion consists of an agreement, between an optometrist about to enter the military service (referred to as the *absentee optometrist*), and an optometrist remaining in practice at home (referred to as the *resident optometrist*). State or local associations of optometrists

can be of assistance in bringing these two together.

In such an agreement, the absentee optometrist agrees to close his office and place his Case-Record-File in the hands of the resident optometrist for the period of the military service of the absentee optometrist. The absentee optometrist also agrees to notify at once, his patients of his departure into military service and to request them to utilize the services of the resident optometrist during his absence. A form similar to the following could be used:

February 1, 1942

ANNOUNCEMENT TO MY PATIENTS:

After February 1, 1942, the writer will be in the armed services, attached to the medical department of the U. S. Navy.

His office in the Local National Bank Building will be closed.

Your Case Record Chart will be on file at the office of Dr. William Z. Jones, optometrist, in the Old Century Block. Dr. Jones has agreed to continue my practice for me for the duration.

It is my wish that when in need of ocular care that you consult Dr. Jones whose professional card is enclosed.

Very sincerely,
DR. JOHN DOE, Optometrist

The resident optometrist agrees to render full refractive service to the patients of the absentee optometrist during his absence. He further agrees to keep intact the Case-Record-File of the absentee optometrist and keep this up-to-date for the absentee optometrist, by the utilization of examination forms and the day-to-day inclusion upon these of data, as he serves the patients of the absentee optometrist.

The resident optometrist further agrees to pay to the absentee optometrist or his heirs or assigns, each month, such sums as represent the difference between the laboratory charges on materials the resident optometrist prescribes for patients of the absentee optometrist and the fee the resident optometrist collects for these materials. The resident optometrist also agreeing to pay to the laboratory the costs of materials so used.

It is further agreed upon between the absentee optometrist and the resident optometrist, that the examination fees and orthoptic treatment fees collected by the resident optometrist, when examining or treating the eyes of patients of the absentee optometrist, be retained by the resident optometrist, as his fee for the services rendered the absentee optometrist and the patients of the absentee optometrist.

The absentee optometrist further agrees to place his past-due and current open accounts in the hands of the resident optometrist for col-

lection. The resident optometrist agreeing to remit, each month, to the absentee optometrist, *all* such monies as are collected by him on the past due and open accounts of the absentee optometrist.

It is further agreed by the resident optometrist, that upon the return from military service of the absentee optometrist, that the previously outlined arrangements be terminated, and the Case-Record-File and account records of the absentee optometrist be returned to him in its entirety.

A Military-Period Practice Merger as just outlined, will go far towards holding together the present practice of an optometrist who joins the military services of our country. The plan will assure the patients of the absentee optometrist, of adequate and proper eye care at customary and agreed upon fees and charges and will properly compensate both optometrists who are parties to this agreement. And what is of even greater importance, such a plan will enable the optometrist who now enters military life, to return at the end of hostilities to a practice which is intact and waiting for him. Carel C. Koch

## SPECIAL REPORTS

### FELLOWSHIPS FOR OPTOMETRY IN PUBLIC ADMINISTRATION*

Richard Feinberg, Opt.D.
New York City

Government is the largest industry in the United States. Its personnel totals over three million and its annual expenditures take a quarter of the national income. As its functions become more numerous and complex the responsibilities for their management rest more and more upon competently trained administrators and technicians. The enlightened public personnel agencies recruit their candidates from those trained in specific and general fields of public administration. The political appointee with his uncertain abilities is rapidly disappearing

*The Author of this Report is the Executive Secretary of the Public Health Bureau of the New York State Optometric Association. He is also a student in the Graduate Division for Training in Public Service at New York University. Submitted on January 5, 1942, for publication in the March, 1942, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

from the scene, due in large measure to the tax-payer who now demands administrative efficiency.

The public health field has not escaped this evolution. Perhaps as a result of the unceasing glare of publicity attached to health administration in this country, even greater caution now exists in the health-agency personnel selection than ever before. The Wagner Bill, Thurman Arnold, Defense programs, Group medicine, all, have kindled such keen popular and governmental interest, that leaders of the professions must be either competently trained in administrative procedures or the whole profession must suffer the consequences of their ignorance.

It has been a noticeable phenomenon, also, that the advanced training of public personnel has introduced a kind of caste system in agency administration. Competently trained administrators, with formal training, tend to give greater recognition to other administrators similarly trained. This is natural for with like backgrounds, "speaking the same language," they tend to see their problems from equally broad viewpoints. To the anxious untrained initiate who may represent a numerically small agency or profession, their attitude appears to become one of condescension.

Optometry has ever been a numerically small profession. Both its leadership and representation have arisen from its political structure. In this, it has not been different from the American Medical Association. However, it is an inescapable conclusion that had we representation from our own ranks in private and governmental agencies we should be much better off. The present emergency will but amplify and further drive home the crying need for our profession to have numbered among its membership men who by virtue of qualified higher training in administration can deal with the problems of eye-care in governmental planning, and in inter-professional relations.

Already the government itself, is developing health administrators from the ranks of the healing professions. Medical men are trained at government expense in this field. The Social Security Agency has set aside funds for the graduate and undergraduate training of nurses, and under the proposed Wagner Health Bill, there would be further funds set aside for the training of a public health personnel.

The American Optometric Association endorsed these proposals for expansion of personnel training in public health. Dr. Leslie R.

Burdette, in his testimony at the hearings on the Wagner Health Bill declared in this connection:

"It is gratifying to note that the framer of this bill (Wagner) recognized the necessity for improved standards of health care and inserted provisions for the training of personnel."

It is, therefore, the premise of this paper that organized optometry should set aside fellowships, or *a* fellowship, in the fields of public administration (especially public health administration), to be awarded to deserving optometrists who have proved their interest in optometric matters and who are good administrative material.

The fellowships can be established at any one of several institutions which offer graduate work in training in public health or public service.

We should be proud that commissions have been granted to optometrists in the United States Navy. Equally important, and perhaps with greater effects, would be the recognition by governmental agencies of optometrists to serve in administrative posts. This can and will happen. Organized optometry can provide the catalyst in the form of fellowships.

DR. RICHARD FEINBERG
MEDICAL ARTS CENTER, 57 WEST 57TH ST.
NEW YORK, N. Y.

## TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

by J. Fred Andreae, Secretary

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

## REPORT OF THE CHAIRMAN OF THE READING DISABILITY PROBLEMS IN THE SCHOOLS*

We, your committee on Reading Disability Problems, submit the following report:

*Presented at the annual meeting of the American Academy of Optometry, at Chicago, Illinois, December 7, 1941, for publication in the March, 1942, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

First, we would suggest that you change the name of the Committee to "The Committee on the Visual Disability Reading Problems," since optometry, and we take it this organization is interested only in visual problems, while there are many reading disabilities other than visual with which we are not, and should not be concerned with.

No funds being provided by the Academy and since even a modest, well controlled and well conducted investigation does require the outlay of at least $2,000, (and certainly the Academy would not suggest sketchily conducted investigations that might bring out misleading psuedo evidence) our report must consist of our experience in office practice coupled with the knowledge we have been able to gain through our memberships in organizations who do conduct controlled investigations.

Dr. L. Jaques has made the elimination of Visual Handicaps Preventing Efficient Reading a major part of his office practice and in addition, has done considerable work in the Public Schools of Los Angeles, starting a program of Preventive Optometry. He is in close touch with educators throughout his district and can well testify that education is interested in elimination of all visual handicaps preventing efficient reading.

Dr. N. Greeman likewise has made the Visual Problems Preventing Efficient Reading an important part of his practice and is making very nice contacts with educators and army circles. Dr. Greeman has emphasized to aviation the facts that visual training does have an important part in keeping aviators visually fit.

A major part of my own practice is concerned with the Elimination of Visual Handicaps Preventing Efficient Reading. In addition, as Director of the American Research Council of Optometry, I have the responsibility of directing the investigations of that organization.

It is interesting to note that the subjects receiving Visual Training in our experiments in Claremont College, Claremont, California, during 1940-41 gained just twice as much in their scoring on the pedagogical tests as did the Control Group, aside from their greater gains in reading speed. Since these pedagogical tests are made by, and scored by, the school staff, they yield indisputable evidence in regard to the value of Visual Training to Eliminate the Visual Handicaps Preventing Efficient Reading.

Apparently, education is more interested in Visual Handicaps

Preventing Efficient Reading than optometry. This is well shown by the fact that the educational system of Boulder, Colorado, is this year cooperating with the American Research Council of Optometry in the continuance of the investigation there. The educational system is furnishing *two full time assistants and one part time assistant* for our laboratory now in operation in the public schools. In addition to this, Dr. Van Alstyne, Assistant Professor of Education in the University of Colorado and School Psychologist, devotes a substantial part of her time to help supervise the laboratory. The American Research Council of Optometry furnishes laboratory equipment and supervises the visual training.

This project at Boulder represents the investment of considerable money by education and shows the confidence of educators in the value of Visual Training to Eliminate the Visual Handicaps Preventing Efficient Reading.

Geo. A. Parkins,
*Chairman of the Reading Disability Problems Committee.*

## BOOK NOTICES AND REVIEWS

Books received are acknowledged by notices in this department. Special selections will be made for more extensive review in the interest of our readers as space permits.

OPTOMETRIC PROCEDURE. E. LeRoy Ryer, Opt.D., F.A.A.O., and Elmer E. Hotaling, Opt.D., F.A.A.O. Foreword by Howard C. Doane, Opt.D., F.A.A.O. Published by the American Optical Company, Southbridge, Mass. 94 pages. Illustrated. Cloth. 1941.

This is the first of a set of four books dealing with ocular refraction. In this volume the authors present their views on certain methods which may be employed in the general practice of optometry. These cover patient approach and professional psychology as well as efficient office procedure. The authors are successful optometrists. The views given by them are the result of years of experience in practice as well as in several forms of educational work.

In a general manner it is suggested that monochromatic light sources be used to a greater extent clinically than at present, particularly in subjective testing and similar refractive techniques. The following texts will, no doubt, deal at greater length with this suggestion.

For years Ryer and Hotaling have been leading forces in the effort to more fully develop all professional aspects of refractive work particularly as this refers to the practice of optometry. This small volume is full of interesting and practical information dealing with all phases of practice building.

As is usual in their writings, the subject covered is well developed and it is hoped that this, and the books to follow, will be given a wide distribution among all optometrists.

CAREL C. KOCH.

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VISUAL PROBLEMS OF SCHOOL CHILDREN. Emmett A. Betts, Ph.D., and Agnes Sutton Austin, M.S., 80 pages and Index, paper bound. Published by the Professional Press, 5 North Wabash Avenue, Chicago, Illinois. Price $1.00.

This is a survey of a group of fifth grade children. "The problem was approached in four ways: first, a battery of visual survey tests were given; second, a complete visual analysis (21 points) was made; third, a cycloplegic examination was made; and fourth, one intelligence test and one reading test were administered for the purpose of determining reading achievement in terms of mental ability."

This study abounds in tables, charts, graphs and correlations between different tests. From this work one may estimate the diagnostic value of a symptom, determine the reliability of a test or approximate a scientific "expected." This paper should be a valuable bit of literature for any optometrist interested in the scientific development of his profession regardless of his attitude toward the implied philosophy.

C. W. MORRIS.

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MANUAL OF OCULAR PATHOLOGY FOR OPTOMETRISTS. George A. MacElree, Jr., O.D., F.A.A.O., Professor of Ocular Pathology and Associate Chief of Staff of the Clinics, Pennsylvania State College of Optometry. Fourth edition. Published by the Press of the Pennsylvania State College of Optometry. Philadelphia, Penna. 474 pages. Cloth. $8. 1941.

In common with most authors, when dealing with the subject of ocular pathology, MacElree follows the procedure of arranging his text

anatomically, devoting a chapter to each of the various portions of the eye, the lids and orbits. Here, however, the similarity ends. This book differs from other works in this field in several important particulars which make this book unique or unequalled in its value to us all as optometrists.

These differences are (1) that its content matter is presented in a scintillating manner, the author including within its covers most, if not all, of the newer thinking and experiences, as these relate to the various pathologies. In so doing the author has drawn freely from the advanced researches of many specialists as expressed in their current writings in the journals serving both optometry and ophthalmology. This book is also different (2) in the complete absence of needless illustrations which clutter up most texts on ocular pathology and add nothing to the information which may be gained by reading them, and (3) that the author has emphasized diagnosis throughout the book thus enabling the optometrist who acquaints himself with this work to better serve his patients.

In placing the accent upon diagnosis one is not to infer that therapies and treatment are overlooked. Quite to the contrary these subjects are rather thoroughly covered, but the author has presented everything possible in the way of aids to diagnosis to assure the reader of having in his hands the material which will assist him in the necessary and proper screening of pathological cases that will benefit by the additional services of other professional men to whom these cases can be referred.

No review of this book would be complete without a few quotations to illustrate the author's readable style and the lucid manner in which he presents his material. In Chapter III, which deals with the Diseases of the Conjunctiva, we find his saying, "Most writers assert that Catarrhal Conjunctivitis, in general, is related to the common cold. This is undoubtedly true, but since the cause of the common cold is thus far unknown, it places Catarrhal Conjunctivitis in the same category. . . . There are quite a few eye men who believe that the condition will heal itself and therefore little or no treatment is required. They are following the same school of reasoning as those general practitioners of medicine who believe that there is no mode of treatment that will cure the common cold. They do believe, however, that treatment helps relieve the symp-

toms and prevents complications. McKee, an acknowledged authority on this disease, recommends that simple physical measures be tried. His favorite treatment both in Acute Catarrhal Conjunctivitis and in Hyperemia of the Conjunctiva is the application of cold compresses. Needless to state, if an ulcer develops under this treatment a change to warm compresses is made. In every case a physical examination is indicated and the patient should be instructed in ocular hygiene." MacElree then presents the etiology, pathology, course, sequelae, prognosis and specific treatment for the various forms of conjunctivitis presenting in each case the newer rational approach to this disease, which in time will no doubt make its cure both simple and sure.

Chapter IX deals with the diseases of the ciliary body. Here we find the author saying, "Unfortunately, the location of the ciliary body renders it impossible of observation. In this respect, it is the only portion of the eyeball that is concealed completely from view. Knowledge concerning the pathology of this structure is only obtained after the eyeball has been reduced to such a state that removal is necessitated. From a study of microscopic sections of diseased eyes, many authorities state that the ciliary region plays an important part in many internal disorders of the eye. The student should not deduce from the comparative brevity of this chapter (10 pages) that the ciliary region is unimportant in respect to general ocular pathology. He should realize that only lack of knowledge is responsible for the dearth of material evidenced here. If a method of observing the ciliary body in situ were available, ocular texts would devote countless pages to disorders of this region." He then takes up the subject of cyclitis, presenting first the diagnostic signs which enable the examiner to differentiate between this condition and iritis. This is followed by the symptoms, clinical picture, etiology, pathology, course, sequelae, prognosis and treatment of this condition in both the simple and purulent forms. Malformations, neoplasms, injuries and degenerations of the ciliary body follow.

In Chapter XI dealing with the Diseases of the Lens, he says, "The exact pathogenesis of Senile Cataract is unknown, and undoubtedly varies from case to case. For this reason, it should be evident that there are *causes* of cataract to be considered, rather than a single cause. During the past decade considerable research has been accomplished on the factors that are thought to produce opacification of the lens, and as a result numerous theories have been advanced." He then presents in considerable

detail these theories, which include (1) physiological change of age. (2) Excessive radiation on the part of the visible spectrum, infra-red radiation and ultra-violet radiation. (3) Specific cytotoxins or poisonous substances which affect the transparency of the crystalline lens. (4) Shrinkage of the lens nucleus. (5) Abiotrophic change, or the normal break down of tissue or cell structure with advancing years. (6) Refractive errors. (7) Decrease in the permeability of the lens capsule thus effecting normal metabolism of the lens. (8) Change in lens proteins. (9) Systemic disturbances such as the increase in blood, sugar, alkalosis, improper calcium metabolism, avitaminosis, and glandular problems. This chapter also includes a complete review of all types and forms of cataract as well as a section dealing with the treatment of this lenticular problem.

Chapter XVI is the last chapter in the book. This deals with the various forms of glaucoma. The causes of increased intraocular tension, its diagnostic signs and its treatment. All forms of glaucoma are presented by MacElree along with their inter-relationship one with the other. Among the numerous suggested aids when this condition is present, and when conditions warrant their use, are the avoidance of darkness, the use of —0.75 D. Spheres in a grab front frame, the keeping of the patient's head as low as possible during sleep and similar suggestions which seem to assist in retarding the condition in certain cases. Emphasis here also is placed upon the diagnostic phases of this condition, as optometrists can play an ever increasing and important role in the weeding out of those cases in which the early signs of this disease are present.

The quotations mentioned in this review indicate both the author's approach to the subject of ocular pathology and also the general readability of his work. We are informed that this book is now in its Fourth Edition. Somehow we missed the first three and that was our loss. The book serves as a text at the Pennsylvania State College of Optometry and can well serve also as a quick and useful reference work in the office of every optometrist. Had MacElree produced a new motion picture epic as fine as this book he would be given five stars—as it is—his labors in this field have won for him the lasting appreciation of his fellow optometrists.

CAREL C. KOCH.

## PROCEDURE AND INSTRUMENTATION

by Guy L. DuPlessis

A department wherein discussions will be carried on relative to the value of various experimental and clinical techniques as employed by practicing optometrists, and also in which the instruments used by optometrists in various phases of their work, will be subjected to some critical evaluation.

### AN AUTOMATIC MULTIPLE FOCUS LENS FOR PHOTOGRAPHIC WORK

Various ingenious methods have been devised to automatically change the focal length of a lens. Liquid cell lenses and synchronized lens systems have found application in both the fields of physics and photography.

In motion picture work an important limitation has been the narrowness of the focal range requiring the action recorded on the film to take place within certain fixed distances.

A natural ambition of cine lens designers was one of broad focal range, thus keeping in focus the image of both distant and near objects.

This was finally accomplished by rapidly oscillating, back and forth, one lens element of a multiple lens battery by mechanical means. This method, devised by Ludwig Dieterich, has been further improved by P. Stanley Smith, in that, in the newer form, the oscillation is produced electronically instead of mechanically.

This new electroplane lens is now made by the *Bausch & Lomb Optical Company* and its use in motion picture photography broadens the field of action by keeping objects at various distances within the focal plane of the film.

For obvious reasons this principle can only be used in motion picture cameras.

### POLAROID BLANKS FOR PRESCRIPTION WORK

Polaroid laminated lenses may now be ground in the private prescription laboratory. The *American Optical Company* announces that polaroid blanks, 8 mm. thick, either plus or minus 6.00 D., rough curve for single vision lenses are available for immediate delivery. Rough Nokrome or Ful-Vue bifocals may be secured on factory order. In all cases, all four surfaces of a pair of lenses must be surfaced in the laboratory.

The *American Optical Company* recommends that certain precautions be taken in the processing operation. Blocking the lenses should be done with a minimum amount of heat, polishing should be "wet," and done at reduced speeds, as excessive heat will damage the polarizing layer. Care should also be used in selecting the lens curvatures so that the grinding operation will not go through the polarizing layer.

Before laying out the blank for cylinder grinding or for edging, the axis of polarization must be marked and placed at meridian 180° in relation to the cylinder axis and the eye-size or frame shape. This can be done by neutralizing a specular reflection from a glossy non-metallic surface directly between the observer and the source of light. Considerable care in this part of the work will assure the proper relationship between the cylinder axis and the polarizing plane.

After being ground and polished the uncut lens should not be cut or chipped to size, but rather should be edged down from its full size to the proper finished size. We are told also that if possible, these lenses should not be mounted in frames with metal rims, but should whenever possible be mounted in frames made of plastic materials. With the exception of above, these new prescription polarized blanks can be processed as are ordinary blanks and lenses.

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## ABSTRACTS

A department in which will appear abstracts of the literature of optometry, ophthalmology and applied optics. These will be classified according to the following list, although contributions to all sections will not necessarily appear in each issue.

1. Ocular Refraction.
2. Physiological Optics and Color Vision.
3. Ocular Muscles.
4. Orthoptics and Reading.
5. Anatomy, Histology and Embryology.
6. Ocular and General Pathology.
7. Ophthalmic Lenses and Material.
8. Instruments.
9. Hygiene and Illumination.
10. Applied and Physical Optics.
11. Education, Sociology and Economics.
12. Miscellaneous.

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### 1. OCULAR REFRACTION

A SHORT ANALYSIS OF 500 CASES. Lampard, J. A. Canadian Optometrist. 1941, 3, 4, 105-106.

An analysis is presented of the diagnostic and refractive findings of 500 rural cases taken from a practice conducted in western Canada. Lampard finds, (1) that 322 of these cases, or 64.4 per cent, were

female, while 178 cases, or 35.6 per cent, were male. (2) These cases fell into the following age groups. Under 20 years of age, 111 cases; 20 to 30 years, 80 cases; 30 to 40 years, 83 cases; 40 to 50 years, 99 cases; over 50 years of age, 127 cases. (3) The time which had elapsed since the patients previous ocular examination was found to be 4.14 years for those cases who had been examined before. (4) In those cases in which lenses were prescribed the following character of formula was given. Convex in 306 cases or 63.6 per cent. Concave in 163 cases or 36.4 per cent. (5) Only 27 cases or 5.4 per cent of the total of 500 cases were found to have evidence of specific ocular or general pathology. (6) Of the 500 cases, 147 were found to be orthophoric. 285 cases were found to be exophoric more than one-half prism diopter, while 64 cases were found to be esophoric by more than one-half prism diopter. The average physiological lag was found to be 5.64 prism diopters for the entire group, while only 5 cases or 1 per cent showed less exophoria or more esophoria at near than at distance.—C.C.K.

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4. ORTHOPTICS AND READING.

ORTHOPTIC TRAINING AND THE SURGICAL CORRECTION OF STRABISMUS. A COMPARATIVE STUDY OF BINOCULAR VISION IN 324 SURGICAL CASES WITH AND WITHOUT ORTHOPTIC TRAINING. Berens, C., Elliot, A. J., and Sobacke, L. American Journal of Ophthalmology, 1941, 24 (December), 1418-1422.

"An analysis of 324 cases of strabismus in which the patients were operated upon during 1938 to 1940 at the New York Eye and Ear Infirmary was made in order to determine the effect of preoperative and postoperative orthoptic training. The patients were divided into three groups. Group I (144 patients) received no orthoptic training; group II (83 patients) were given postoperative orthoptic training; while in group III (97 patients) preoperative and postoperative orthoptic training was administered.

"Before operation a deviation of from 41 to 60 prism diopters was present in 63 per cent of groups I and II (no preoperative orthoptic training) and in 53 per cent of group III (after preoperative orthoptic training. Apparently the deviation does not usually change to any marked degree as the result of orthoptic training alone, unaided by the correction of ametropia.

"Preoperatively abnormal retinal correspondence was present in 61 per cent of 227 patients in groups I and II (groups receiving no orthoptic training before operation); by means of orthoptic training, normal retinal correspondence was established before operation in 75 per cent of the patients in group III.

"Before operation in group III (preoperative and postoperative orthoptic training), 35 per cent of the patients had first-grade binocular vision and 24.05 per cent had second-grade binocular vision.

"Following operation, orthophoria or heterophoria resulted in 22 per cent of the patients in group I, in 50 per cent in group II, and in 63 per cent of the patients in group III; that is, the postoperative results were almost 300 per cent better in the patients receiving orthoptic training before and after operation (group III) as compared with the group on which only surgery was performed (group I).

"In our opinion orthoptic training is an indispensable adjunct to the surgical treatment of strabismus; that is, in overcoming anomalous retinal correspondence and amblyopia and in developing fusion with increased amplitude. Most of the actual reduction of the deviation in strabismus usually must be obtained by operation and the correction of ametropia."—R.J.B.

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VISUAL ADAPTATION AND AMBLYOPIA. Gibson, H. W. Optician. (London). 1941, CI, 2627, 387-390.

In the early stages of the treatment of amblyopia the energies of the optometrist must be directed to the strengthening of the visual impulse, and during the latter stages to the production of good visual acuity. Gibson suggests the use of illumination of the maximum brilliancy which will not produce glare effects, and if colored targets are made use of, he further suggests that it will be necessary to vary the illumination in accordance with the color used to obtain the maximum brilliancy and effect. Part of the treatment technique should consist of the application of illumination in short flashes with comparatively long periods of dark adaptation in between the flashes in order to enhance the contrast and increase retinal sensitivity. In giving this portion of the treatments Gibson suggests that the illumination in the orthoptic room be at a very low level to assist in increasing the contrast effect of the flash stimulation.

In developing visual acuity Gibson suggests that it is necessary to secure the best results that targets should consist of white and black illustrations on a matt surface. Each illustration having sharp contours and well defined borders. The illumination of the targets should be of but moderate uniform intensity with all shadows and reflections eliminated. Gibson advocates that in this portion of the treatment techniques particular use should be made of the general association of senses in the higher centers of the brain and their derivatives such as memory and experience.—C.C.K.

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CLINICAL OBSERVATIONS ON THE TREATMENT OF SQUINT. Feldman, J. B. Archives of Ophthalmology, 1941 (July), 26, 38-56.

"A report of the cases of 56 private patients and 72 clinical patients treated orthoptically is given under two separate headings. The variation in the data on the two groups for any of the anomalies will possibly explain how it happens that two observers arrive at somewhat different conclusions for the same entity. It also indicates that the two or three lessons a week given the patients at the clinic resulted more favorably than the single weekly lessons given the private patients. The predisposing factors and the phenomena usually thought to accompany squint are discussed. The requirements preliminary to orthoptic treatment are outlined. The superiority of atropine to homatropine for mydriasis is shown. The obstacles to orthoptic training are discussed. with their incidence in the groups examined and the percentage of patients finally cured of each particular anomaly. Perimetric studies of amblyopia, alone or combined with squint, are given for a few cases, in which uniocular fixation was used. A chart used in addition to the detailed history is shown, by which the ophthalmologist can quickly note the cosmetic effect of the treatment. Finally, 6 children with stubborn squint were examined by the neuropsychologic department. If the report had been received prior to the inauguration of orthoptic treatment it would possibly have affected my decision as to whether or not such a tedious and time-consuming procedure was worth while in some cases. Orthoptic treatment is of value in that it may often overcome an obstacle not remedied by surgical means. It supplements normal physiologic function with cosmetic cure when possible."—R.J.B.

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6. OCULAR AND GENERAL PATHOLOGY

SYSTEMIC DISTURBANCES FROM ERRORS OF REFRACTION AND OF DIET. Ray M. Moose. American Journal of Ophthalmology. 1942, 25, (February), 194-198.

This paper deals largely with the following twelve general symptoms that are commonly complained of by adult patients who come in for glasses, and who show no other evidence of a focus of infection: Headache, feeling too tired, touches of rheumatism, constipation, vague digestive complaints, nervousness, poor appetite, dizziness, disturbed sleep, feeling cold, skin disturbances, cold or sweaty hands. The author together with an internist, studied the food habits of 258 consecutive adult patients for whom glasses were prescribed, put them on a corrected diet and gave them vitamin concentrates to hasten recovery from any possible deficiencies. Of the 100 patients who returned for a check-up one or two months later, fifty were used as controls, that is, only glasses were prescribed, while fifty were given glasses, corrected diets, and vitamin concentrates. Both groups had about the same distribution of symptoms. At the first office visit one or two months later, the severe symptoms, except constipation, were shown to have been markedly reduced among the fifty treated patients, that is, among those given glasses, diets, and vitamins. Only in the case of headaches did the control group (those getting glasses alone) show a decided result. In addition to questions regarding the severity of the symptoms, the following objective observations were made on both groups: Blood pressure, condition of skin of face, hands, and arms, color and texture of nasal mucous membranes, degrees of coldness and moisture of hands. The rapid relief experienced by the treated group shows the value of obtaining information regarding the food habits of the patients. The detailed histories of these patients revealed the following types of dietary errors:

1. Low intake of milk and cheese. This usually means low intake of calcium.

2. Deficiency of animal protein from low intake of meat, milk, cheese and eggs.

3. Excess bread, sweets, and pastries from white flour and cane sugar. These are relatively devitalized foods which are not only comparatively free from vitamins, but deficient in iron and other minerals. —R.J.B.

9. HYGIENE AND ILLUMINATION.

THE PROBLEM OF SIGHT CONSERVATION AS RELATED TO THE GENERAL PROGRAM OF SCHOOL ORGANIZATION. French, R. S. Sight-Saving Review. 1941, 9, 1, 7-12.

The relation of the school to the problem of sight conservation is presented by French, who enumerates some of the responsibilities which face administrative school people. These are, (1) all principals and teachers may be conscious of the problems of sight conservation and of effective and comfortable vision under the conditions of classroom laboratory, library, sewing room, shop, gymnasium and playground. (2) They may likewise know the general hygiene of the eyes and the requirements of the usual school tasks involving visual effort. (3) They can acquaint themselves with such visual and lighting standards as those set forth by the National Society for the Prevention of Blindness and the Illuminating Engineering Society. (4) They can urge adequate lighting and proper painting in all rooms and usually secure action. (5) They can back a program of eye testing and secure local cooperation. (6) They can develop a consciousness of eye care among their charges, applying not only to the tasks of the school but to automobile driving and home tasks. (7) They can, through reading and by inviting specialists to their meetings, become intelligent and even expert to a degree in matters of visual environment and eye care. (8) They can counteract the propaganda of self-interest and of extremists by taking a sane attitude and a middle course. (9) They can effectively aid sight saving by giving out for class use only legible materials and by introducing an ever increasing percentage of non-visual tasks or tasks involving only the coarser aspects of visual usage. (10) They can also introduce eye-rest periods of two or three minutes in the midst of fine or exacting visual work.—C.C.K.

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11. EDUCATION, SOCIOLOGY AND ECONOMICS

NUMBER OF REJECTEES IS OPTOMETRY'S PROBLEM. Mailler, L. B. Optometric Weekly. 1941, 32, 28, 806-807.

In May, 1941, Assemblyman Lee B. Mailler, Chairman of the New York State Health Commission, in addressing an optometric convention said, "Now, and for some time past, we have been working on

plans for the rehabilitation of rejectees both for military and industrial purposes. Naturally, this problem does not confine itself to optometry. It must perforce include dentistry and every field of diagnostic and curative medicine and surgery. It does not admit of ready and easy solution, yet we hope to have underway shortly in New York State, a thorough-going program for rehabilitation, both of military rejectees and industrial rejectees. It is obvious that the human salvage represented by such a program will be a contribution of utmost importance to the defense work. I may assure you that we are counting, and counting heavily, on the training, the skill, and the patriotism of the optometric profession." Mailler also pointed out, that a survey indicates, that of patients having eye defects that 94.8 per cent were patients who required only the correction of refractive errors or other conditions which come within the scope of optometric practice.—C.C.K.

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INDUSTRIAL RELATIONSHIPS. Wittekind, J. R. Pennsylvania Optometrist. 1941, 10, 3, 3-4.

Visual surveys in industry which are made for the purpose of selling glasses must not be tolerated. Visual consulting work in industry embraces much more than mere refraction of employees. In addition to a complete knowledge of ocular matters, lighting, and other seeing conditions, it is necessary for the specialist to fully understand the work done by various employees and the specific conditions peculiar to certain types of work if the survey is to be of value to both the employee and employer.—C.C.K.

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CONSERVATION OF MANPOWER IN DEFENSE INDUSTRY. Zimmer, V. A. Journal of the American Optometric Association. 1941, 8, 2, 51-52.

Zimmer comments on industrial eye safety and efficiency. He finds (1) that out of every four industrial eye injuries, one causes permanent loss of vision. (2) On a basis of 15,000 ocular examinations that 15 per cent of the workers examined had serious ocular defects which required corrective measures, and (3) that nearly a million workers in America today need the professional services of an optometrist or ophthalmologist.—C.C.K.

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OPTOMETRIC EDUCATION. Woll, F. A. Optical Journal and Review of Optometry. 1941, LXXVIII, 18, 29-30.

Woll suggests that optometric colleges follow medical and dental schools in having students take their purely collegiate subjects in academic colleges and give the optometric students only the professional subjects required for an optometric degree. His comments do not effect universities having optometric schools. For some private colleges in optometry his suggestions would necessitate a change in policy, to one in which the student would take from two to four years of academic work before entering the professional school.—C.C.K.

## ANNOUNCEMENTS OF REGIONAL OPTOMETRIC MEETINGS

BOSTON. March 22, 23, 24 and 25, 1942. Meeting of the New England Council of Optometrists. Hotel Statler. Dr. J. H. Bonney, President, 47 Winter St., Boston, Mass.

CHICAGO. April 12, 13, 14 and 15, 1942. Meeting of the Great Lakes Optometric Educational Congress, Morrison Hotel. Dr. J. A. Hattstrom, Educational Chairman, 1724 Sherman Ave., Evanston, Ill.

NEW YORK CITY. April 19, 1942. Meeting of the Interprofessional Relations Committee of the New York State Optometric Association. Hotel Pennsylvania. Dr. Bernard Meyer, Chairman, Suite 1, 202 West 103rd St., New York, N. Y.

PITTSBURGH. April 26, 27 and 28, 1942. Meeting of the Middle Atlantic Educational Congress. Roosevelt Hotel. Dr. H. Ward Ewalt, Jr., Chairman, Jenkins Arcade, Pittsburgh, Penna.

Current Comments by Carel C. Koch

A Monthly Department

in which the Editor of the AMERICAN JOURNAL OF OPTOMETRY & ARCHIVES OF THE AMERICAN ACADEMY OF OPTOMETRY will discuss items of news of general interest: such as relate to new instruments, clinical techniques, education, public health, and optometric legislative and organization problems.

## A LOOSE-LEAF "DAY-BOOK" AS A WAR-TIME SUPPLEMENT TO CLINICAL RECORD KEEPING

Optometrists whose recollections of practice procedures cover a period of thirty or more years will remember the "Day-Books" then in use, to record in permanent form the essential details of business as done from day to day.

During a recent visit to a nearby city, the writer, who is too young to have encountered such "Day-Books" in his own practice, was shown a set in the offices of an elderly optometrist. These books had been in use, for a period covering four years, from 1907 to 1911.

They were, in effect, simple ledger books with each page ruled off into six rectangles. In each of these spaces was then entered the name, address and prescription of each patient served, along with the quality of the frame used and other data relative to the material supplied to the patient.

A thumbing of these old pages indicated that the practice of optometry in those days largely consisted of correcting presbyopia and moderate and high amounts of myopia. This was done principally with spherical lenses. Some of the data so recorded also indicated the style of frame used such as solid-gold or gold-filled and the eye-size of lens, these being 1 eye or 0 eye.

Notations here and there indicated that the lenses used were all "flats," probably either bi-convex or plano-concave, or else, the then new periscopic line, a form of lens with a base-curve of —1.25 D. Sph. The latter lenses considered in that day, a big step forward in lens design.

No effort was made to record the patient's symptoms, visual acuity or any other clinical data which the examination of that period may have disclosed. Just the bare business details were written into the record, either in pencil or with pen and ink. The name and address, the date, lens formula, frame, size of eye and the fee collected. That was all. Yet we are told, it seemed to suffice. When one book was filled another was added. One such record following the other without regard

to the alphabet or any other sequence. As one page was filled, the next was ruled and used and everything then deemed necessary in record keeping was buttoned-up in the ledger at the close of every day.

We are told, too, that *those* were pleasant days. For the most part, patients were not in a hurry; eye examinations were fairly easy to make; there were no accommodative-convergence problems, nor 21 points to worry about. Most patients paid cash and more than one-half of them used solid-gold frames of high quality.

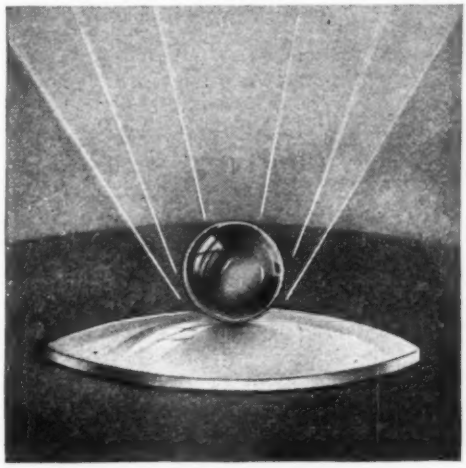
But times have changed. We find in 1942 another great war in progress. Patients are distracted and hurried. Eye examinations are quite complex. Refractive routines have expanded until today an optometrist is obliged, in each case, to record many times the amount of technical data recorded years ago. And as this is done, the records of cases treated and corrected, increase proportionately in value. The optometrist's "Case-Record-File" is today his most valuable possession. More valuable by far, than his instruments, as the latter, if destroyed, can be replaced. But if his file of records is destroyed, it is gone forever.

For that reason it may be well to bring back some form of the old time "Day-Book." Not to replace the more necessary modern record chart, now in wide use, but only to supplement it, and to assure the optometrist that a *duplicate* set of records are available, in safe keeping, to serve as an emergency set, if the originals are destroyed.

An American city has already been attacked through the air. It is probable that other attacks will be made in various parts of our country. While these attacks will signify but little from a military standpoint they can seriously embarrass and inconvenience an optometrist should his office be involved in the destruction so casually meted out to the civil population.

In war times, such as these, a duplicate set of clinical records, kept at home for safe-keeping, and brought up-to-date with loose-leaf additions which are carefully written out each day and taken home and filed each night, will immeasurably add to the peace of mind of the practitioner. And in the event of trouble will assure him of always having in his possession one of his most valuable assets—the clinical record charts of his patients.

CAREL C. KOCH.



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